DoD Architecture Framework Overview

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November, 2003

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- Framework Definitions and Purpose
- Framework Documents Overview
- Future Evolution of Framework

Framework Definitions and Purpose

Architecture Definition

- **Architecture**

"The structure of components, their relationships, and the principles and guidelines governing their design and evolution over time."
DoD Integrated Architecture Panel, 1995, based on IEEE STD 610.12

"An architecture is the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution."
IEEE STD 1471-2000

Architecture Framework

- "An architecture framework is a tool... It should describe a method for designing an information system in terms of a set of building blocks, and for showing how the building blocks fit together. It should contain a set of tools and provide a common vocabulary. It should also include a list of recommended standards and compliant products that can be used to implement the building blocks." [TOGAF 8, OpenGroup]
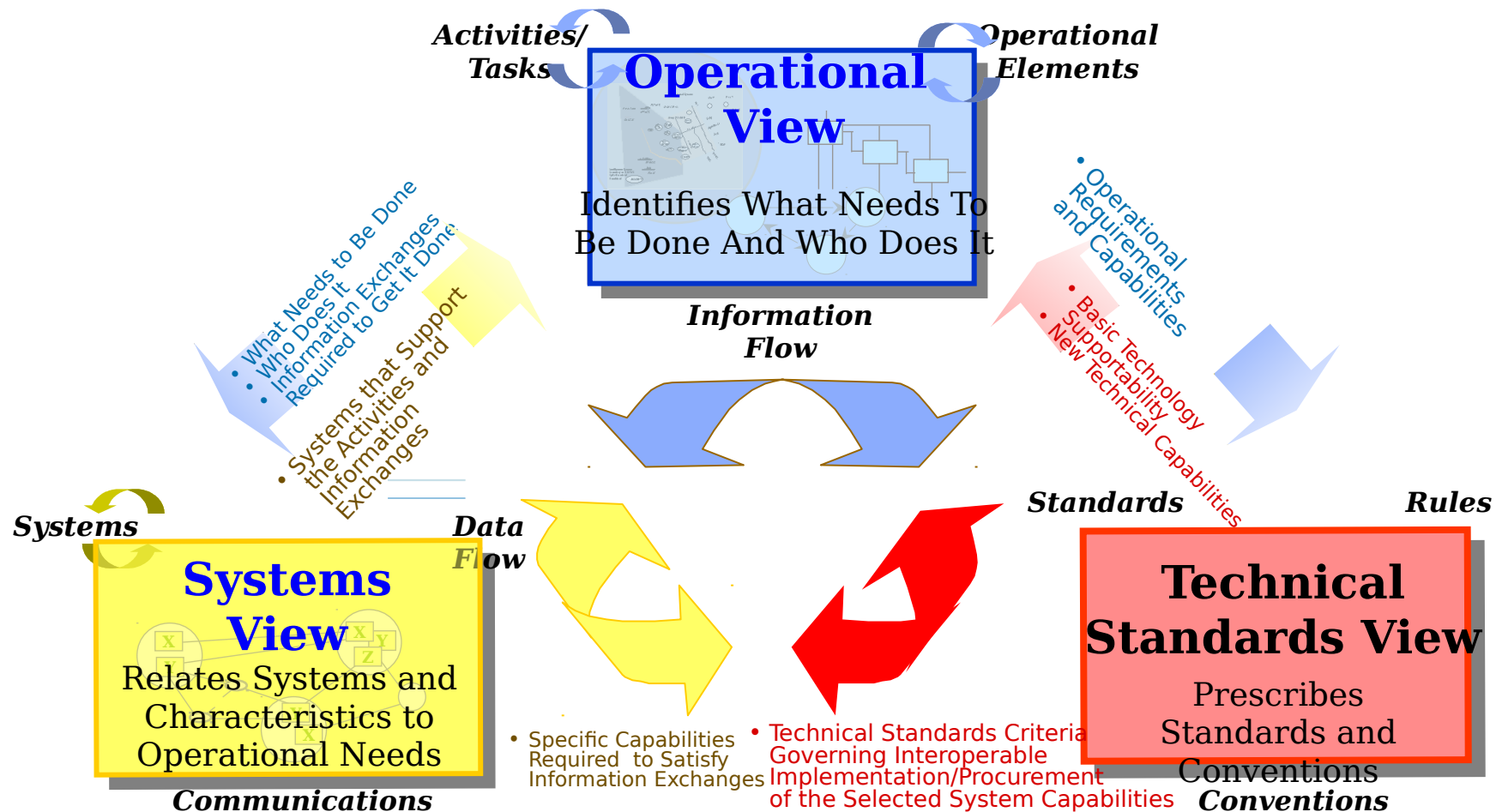
DoD Architecture Framework 1.0

- The Department of Defense (DoD) Architecture Framework (DODAF)
  - Defines a common approach for describing, presenting, and comparing DoD architectures
  - Facilitates the use of common principles, assumptions and terminology

- The principal objective of the Framework is to
  - Ensure that architecture descriptions can be compared and related across organizational boundaries, including Joint and multi-national boundaries
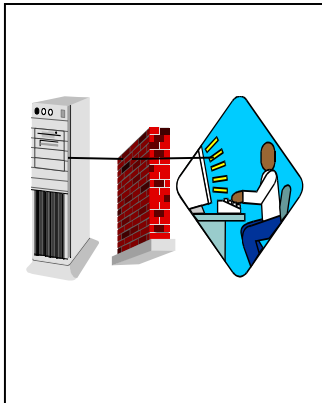
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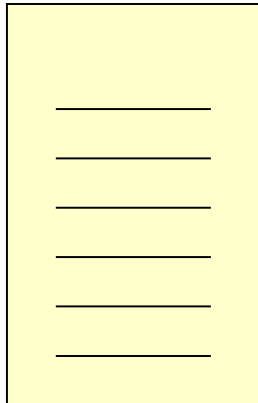
DODAF Basic Principles - An Integrated Architecture with Three Views

Activities/ Tasks

Operational Elements

Operational View

Identifies What Needs To Be Done And Who Does It

- Operational Requirements and Capabilities
- Basic Technology Supportability
- New Technical Capabilities

Information Flow

- What Needs to Be Done
- Who Does It
- Information Exchanges Required to Get It Done

- Systems that Support the Activities and Information Exchanges

Systems

Data Flow

Standards

Rules

Systems View

Relates Systems and Characteristics to Operational Needs

Technical Standards View

Prescribes Standards and Conventions

- Specific Capabilities Required to Satisfy Information Exchanges

- Technical Standards Criteria Governing Interoperable Implementation/Procurement of the Selected System Capabilities

Communications

Conventions

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DODAF Products - Graphic, Textual, and Tabular

Graphic

Text

Tabular

Dictionary Relationships

	Organizations	Locations	Functions	Applications	Entities	Database/file	Tech Platform
Organizations							
Locations	X						
Functions	X						
Applications	X	X	X				
Entities		X		X			
Database/file				X	X		
Technology Platforms	X		X	X			

Operational Node Name

Needline Name

Operational Activity

Link Name/ID

Systems Node Name

System Name

System Component Name

System Function Name

Component Interface Name

Use products to:

Capture

Communicate

Analyze

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ASD (NII) DoD CIO

Operational View

Systems View

Implementation & Design Domain

Technical View

Enterprise/Mission Needs - Information Interoperability Requirements

System of Systems Architecture (Software Intensive)

Information (Software Parts)
Software Engineering Design and Development Processes

Manufacturing (Hardware Parts)
Systems Engineering Design and Development Processes

Industry Standards
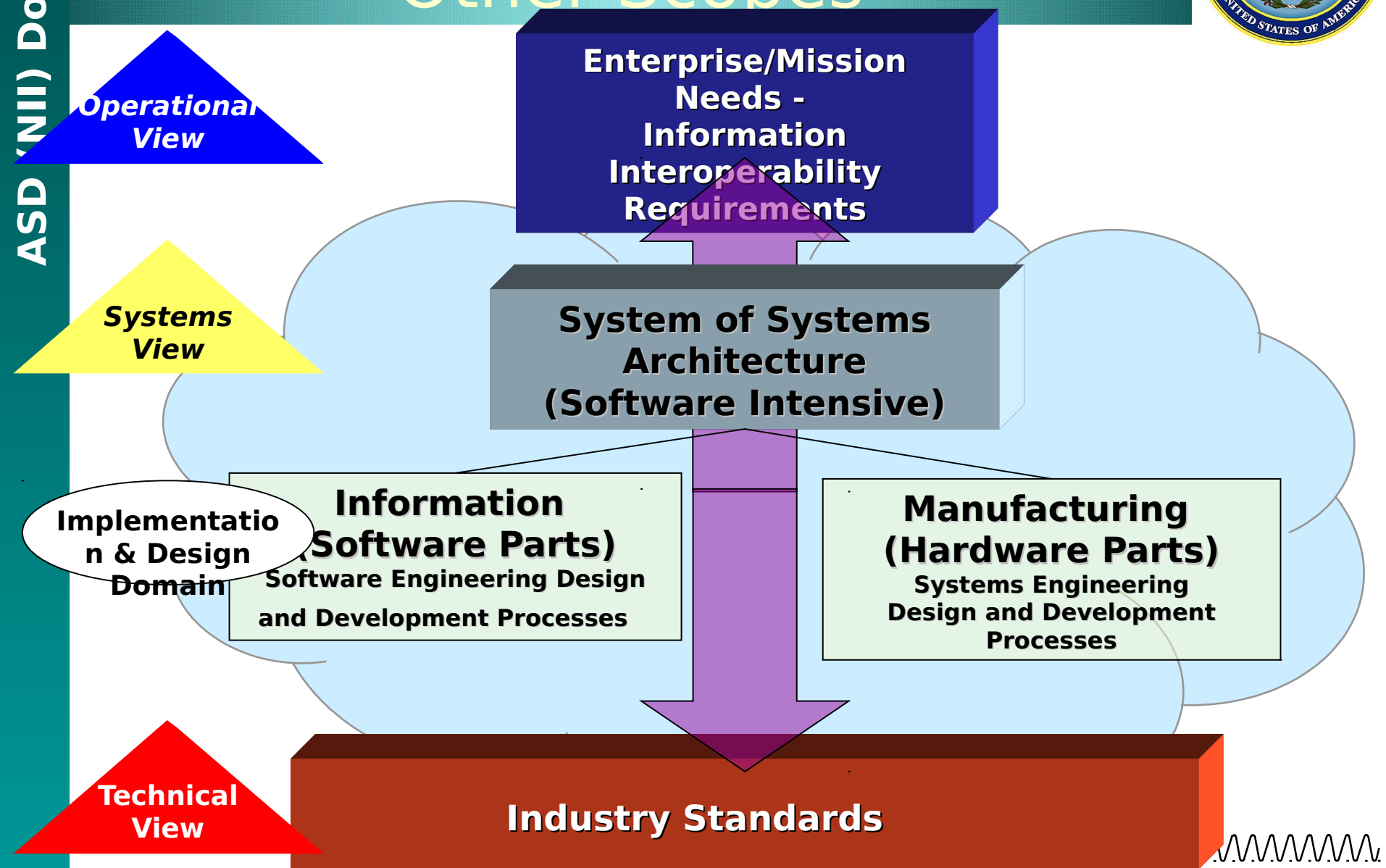
Framework Documents Overview

DoD Architecture Framework

- – Volume I: Definitions, Guidelines , and Background
  - Covers value of architectures, measures, use in DoD processes
- – Volume II: Product Descriptions
  - Covers Structured Analysis and UML Representations
- – Deskbook: Architecture Guidance
  - Provides guidance on development, use, incorporating security into the architecture
- – Release Date – November 2003
- – Web Site:

http://aitc.aitcnet.org/dodfw/
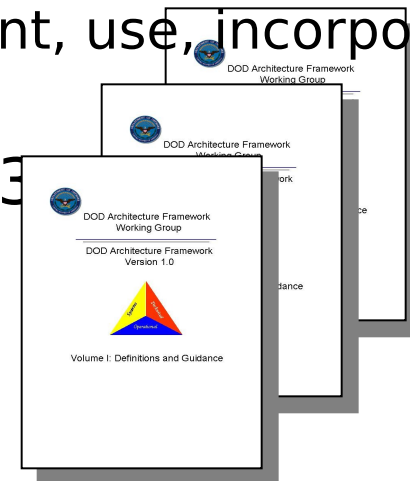
Volume I: Definitions, Background, and Guidelines

- Definitions
  - Architecture, Framework, View, Product
- Background
  - Policies
  - History
- Guidelines
  - Value of architectures
  - Architecture measures
  - **Use of architectures to support DoD processes**
  - The six-step process
- Audience
  - Decision makers
  - Managers

ASD (NII) DoD CIO

- DoD Processes**:**

- Investment decision making –

  – Examine programmatic considerations such as consolidations, and proposed systems, in context with Joint interoperability needs, leveraging opportunities, and expected impact on mission effectiveness

- Capability and interoperability analysis –

  – Analyze architectures in terms of their support to joint concepts, identify capability needs, and determine the operational and support-related performance attributes of a system(s) that provide the capabilities required by the warfighter

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ASD (NII) DoD CIO

- DoD Processes**:**

- **Acquisition program management and system development** –

  - Determine system concepts related to operational concepts and ensure interoperability within a family of systems/system of systems (FoS/SoS)

- **Operational planning** –

  - Examine how various mission participants, systems, and information need to play together; what problems may be encountered; and what quick fixes may be available

Key Changes in Volume I

APPLICABLE ARCHITECTURE PRODUCTS

RECOMMENDED USES OF ARCHITECTURE:	All View		Operational View (OV)							Systems View (SV)											Tech Stds View	
	1	2	1	2	3	4	5	6	7	1	2	3	4	5	6	7	8	9	10	11	1	2
Planning, Programming, Budgeting Execution Process																						
Capability Based Analysis for IT Investment Decisions																						
Modernization Planning and Technology Insertion/Evolution																						
Portfolio Management																						
Joint Capabilities Integration and Development System																						
JCIDS Analysis (FAA, FNA, FSA)																						
ICD/CDD/CPD/CRD																						
Analysis of Alternatives (AoA)																						
Acquisition Process																						
Acquisition Strategy																						
C4I Support Plan																						
System Design and Development																						
Interoperability and Supportability of NSS and IT Systems																						
Integrated Test & Evaluation																						
Operations (Assessment, Planning, Execution, …)																						
Operations Planning & Execution																						
CONOPS & TTP																						
Communications Plans																						
Exercise Planning & Execution																						
Organizational Design																						
BPR/FPI																						

● = Product is highly applicable
◐ = Product is often or partially applicable
(gray) = Product is specifically addressed in policy
(dark gray) = Product is required for an Integrated Architecture
blank = Product is usually not applicable

- **Matrix provides guidelines on which architecture products are applicable to various uses of architecture**

- Product Description
  – Definition
  – Purpose
  – Detailed description with templates and/or examples
  – UML representation
  – Data elements definitions
  – CADM support
- Audience:
  – For the manager, product definition and purpose section:
    - Provide a brief overview of architecture products,
    - Describe potential uses of architecture products
    - Allow assessment of products needed to support decisions

Volume II: Product Descriptions

- Audience for Volume II (cont'd)
  - For the architect and engineering team, a detailed description, and architecture data element definitions section:
    - Allow identification of products to be included in the architecture based on architecture's intended use
    - Facilitate determination of architecture data needs
    - Allow identification of sources for the architecture data
    - Allow analysis and comparison of the data gathered
    - Facilitate composition of data into architecture products
  - For the architecture data modelers, tool developers, and engineers, a CADM entities and relationships section:
    - Facilitate implementation of a CADM compliant architecture Modeling tool
    - Facilitate implementation of a CADM compliant architecture data repository

Key Changes in Volume II

- Greater emphasis on architecture data underlying the architecture products
  - Data element tables and element attribute definitions

DoD Architecture Framework (DODAF)

Common approach for developing an architecture description

Common Underlying Meta Model

Common underlying structure for capturing architecture data
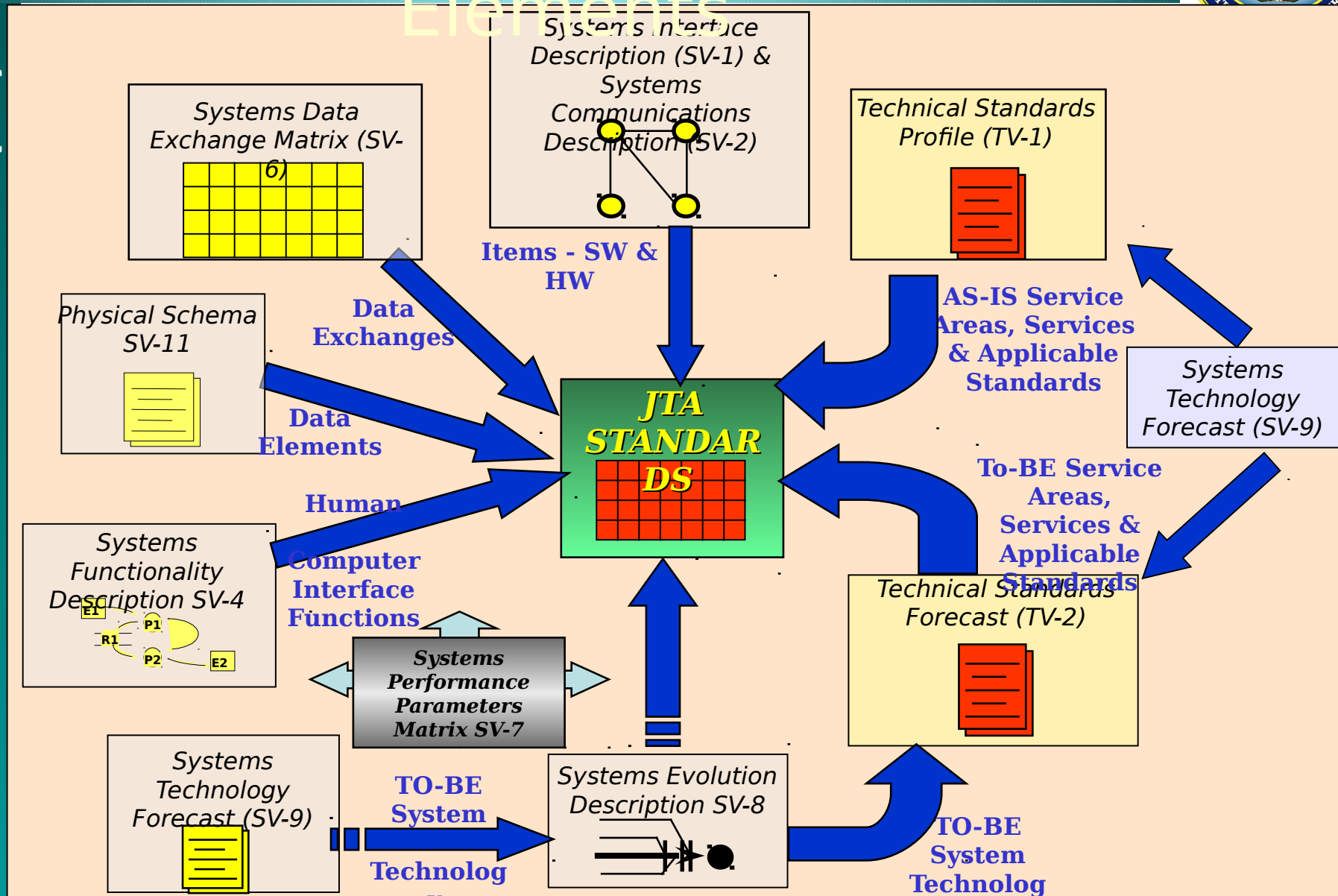
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Key Changes in Volume II

- New emphasis on capability-based analysis:

  - Operational Activity Model + DOTMLPF Attributes (Operational Activity Sequence and Timing Descriptions OV-6)

  - Expanded SV-5 Matrix relating Operational Activities to System Functions, Operational Activities (in an operational thread) to Capabilities, and Capabilities to Systems

Key Changes in Volume II

- Guidance on developing architecture products using UML

- Section on product and data element interrelationships

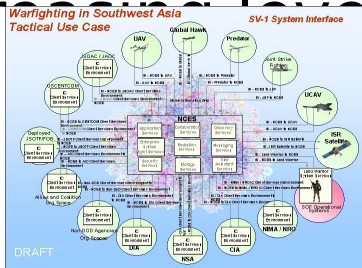- Technical View is re-titled the Technical Standards View. The acronym remains TV

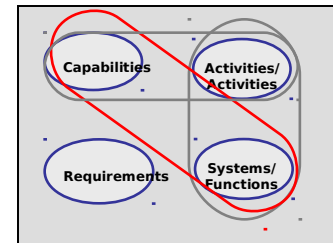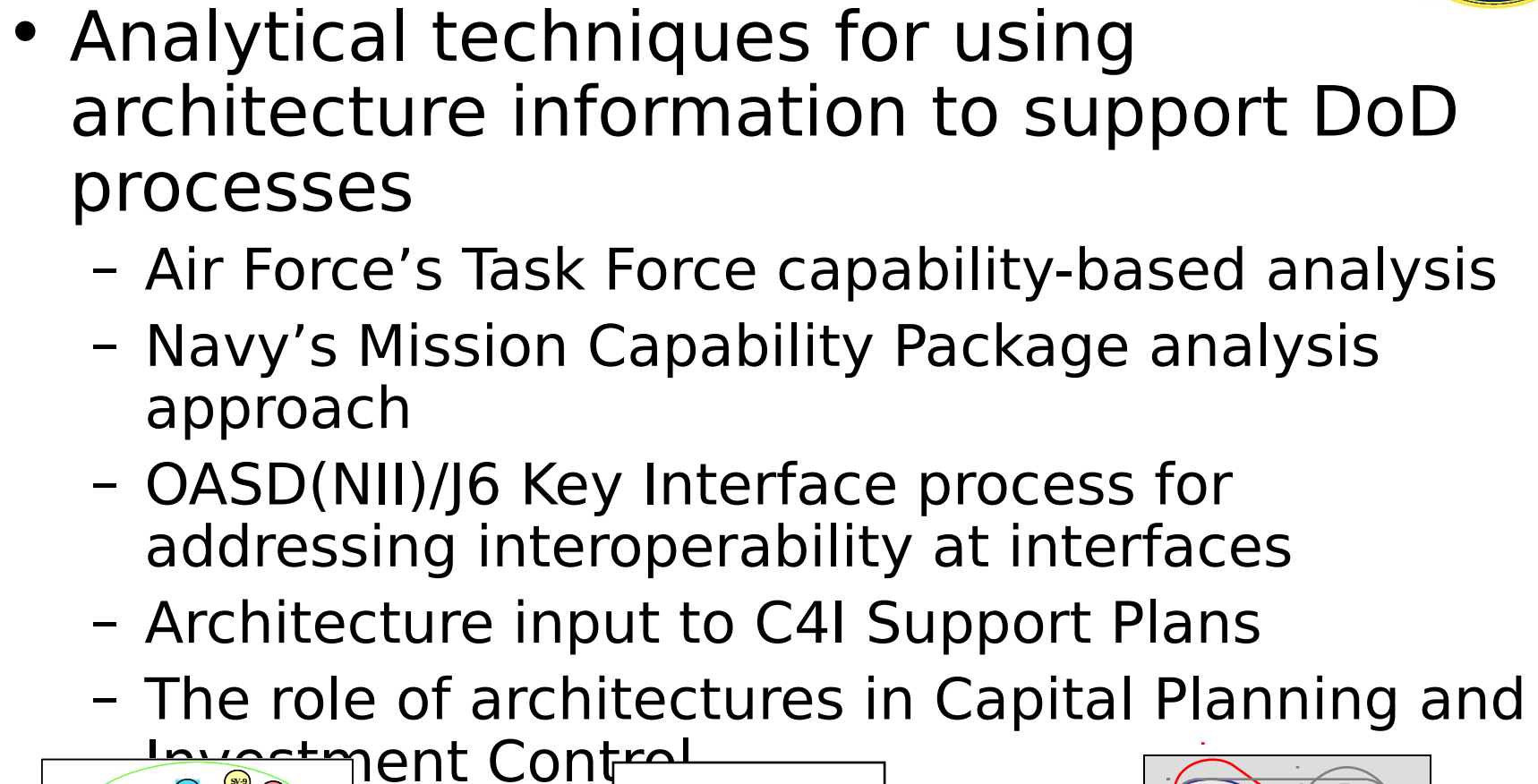# TV-1 Correlates Standards To Systems View Architecture Elements

ASD (NII) DoD CIO

Systems Data Exchange Matrix (SV-6)

Systems Interface Description (SV-1) & Systems Communications Description (SV-2)

Technical Standards Profile (TV-1)

Physical Schema SV-11

Items - SW & HW

Data Exchanges

Data Elements

AS-IS Service Areas, Services & Applicable Standards

Systems Technology Forecast (SV-9)

Systems Functionality Description SV-4

Human

Computer Interface Functions

JTA STANDARDS

To-BE Service Areas, Services & Applicable Standards

Technical Standards Forecast (TV-2)

Systems Performance Parameters Matrix SV-7

Systems Technology Forecast (SV-9)

TO-BE System

Technology

Systems Evolution Description SV-8

TO-BE System Technology

- Several techniques for developing architectures
  - Two architecture development processes
  - Notional examples of selected products portraying Network Centric Operations Warfare (NCOW)
  - Representing the role of humans in architectures
  - Description of a Capability Maturity Profile
  - Security and Information Assurance Architecture
  - Developing architecture descriptions at increasing levels of detail

- Analytical techniques for using architecture information to support DoD processes
  - Air Force's Task Force capability-based analysis
  - Navy's Mission Capability Package analysis approach
  - OASD(NII)/J6 Key Interface process for addressing interoperability at interfaces
  - Architecture input to C4I Support Plans
  - The role of architectures in Capital Planning and Investment Control

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# Deskbook: Supplementary Material Areas Addressed

- Additional information

  - CADM support of architectural concepts
  - Criteria and approach for assessing architecture tools
  - Alignment with The Federal Enterprise Architecture (FEA) Reference Models
  - Updated Universal Reference Resources
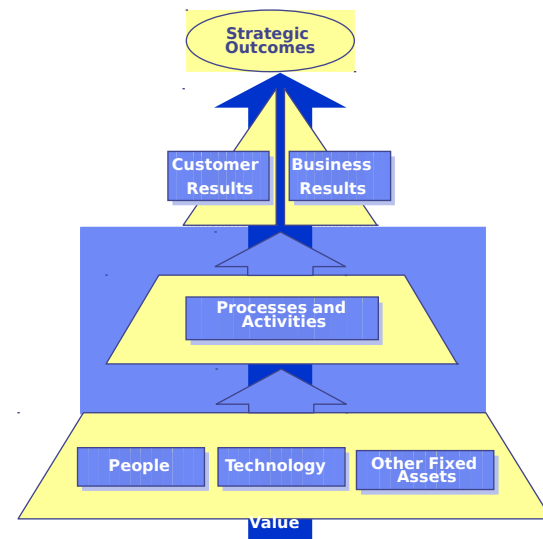
Future Evolution of Framework

Pillars for a Common Approach for Developing Architectures
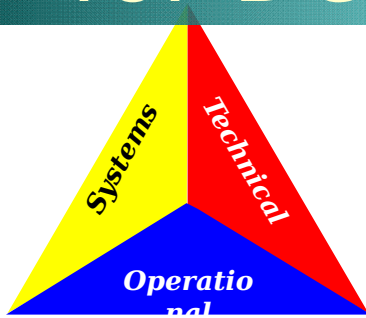
Systems

Technical

Operational

DoD Architecture Framework (DODAF)

Common approach for developing an architecture description

Common Underlying Meta Model

Architecture Meta-Data Standard

Common underlying structure for capturing architecture data & Relationships

Benefits of Architecture Meta-Data Standardization

- Reuse of data

- Consistency that facilitates integration

- Flexibility in partitioning of data from different points of view

- Ability to use automated architecture and modeling tools interchangeably

- Better support for analysis and

Increased emphasis on development of *integrated architectures*

De-emphasis of an architecture product by

Architecture Modeling Standards

- Architecture modeling standards are still evolving, chance to help define and contribute

- Initiatives underway to address this need

  - ISO 10303 (AP-233) standards effort for SE data interchange and tool interoperability

  - INCOSE / OMG effort to extend UML to modeling of systems

ASD (NII) DoD CIO

Define a DODAF Object Model to:

- Validate and Clarify the *information* definitions provided by the DoDAF
    - To capture the architecture data elements (object and relationships) described by DoDAF
    - Use DoDAF definitions to define an object model

- Validate and Clarify the *notation* definitions intended by DoDAF
    - Adjust the object and relationship definitions to include graphics (e.g., modeling notation) and/or formatting characteristics that are required to be common

- Facilitate the common usage of such a model
    - Define an ontology: identify the generalizations / specializations (supertypes / subtypes) that are appropriate
    - Provide clear, concise descriptions for all the data elements

- Benefits - A DODAF object model will:
  - Provide a common set of objects and relationship definitions (requirements) that can be used by tool vendors to supply software tools that support the development of DoDAF-Compliant architectures

  - Provide a common set of objects and relationship definitions against which a standard interface can be defined to:
    - Enable the sharing of architecture model / products between different tools
    - Enable the implementation of a common repository for architecture data

ASD (NII) DoD CIO

- Define a common ontology of architecture elements

- Address baseline (current) and objective (target) architectures

- Address use of architectures to measure mission effectiveness (capabilities and measures of effectiveness)